Temperature on the Surface of Fixed Stars and of the Sun, Compared with that of Terrestrial Heat-Sources,* by Prof. J. Scheiner, Potsdam.

Investigating the spectra of the brighter stars by means of photographs, made at the Potsdam Observatory, I observed the peculiar behavior of a line which belongs to the spectrum of magnesium (448.^{mm}). This line is very prominent, on account of its breadth or intensity, in nearly all spectra of Class I; it even reaches the breadth of the hydrogen lines in spectra of this class which are poor in lines. It is also very prominent in the spectra of *Sirius*, *Vega*, *Procyon*, and others (which are richer in lines), although not so much so as in the last mentioned case. In the solar spectrum, and in other spectra of the Class II*a*, the line is weak, and could not be found at all in some stars belonging to this class, and it seems that it becomes weaker the more nearly the star-spectrum approaches Class III. In the artificial spectrum of magnesium the intensity and breadth of this line is also subject to great changes. The line is not observed in the spectrum of free-burning magnesium, and of magnesium vapor in the electric arc; but it reaches great intensity and breadth in the electric-spark spectrum. This had already been found by Liveing and Dewar,† and the investigations of Kayser and Runge, as well as my own, have confirmed the correctness of their observations.

At first sight we might be induced to explain the peculiarity of the line by a difference in temperature of magnesium vapor in the electric arc and the electric spark, and draw conclusions regarding the temperatures on the fixed stars. Since, however, it is impossible to distinguish sharply between the influence of temperature and pressure, we are only permitted to conclude that the magnesium vapor on stars of Class I is in a condition similar to that produced by the electric spark of great intensity; and on stars of Class II in a condition similar to that produced by the electric arc.

Another magnesium line (435.2^{mm}), however, shows, according to my observations, an entirely opposite behavior to the one discussed above. It does not appear in any of the spectra of those stars of Class II*a* which are poor in lines, but becomes

* Translated by Mr. C. A. Stetefeldt, for the Society.

† *Proceed. R. Soc.*, Vol. XXX.

visible in the spectra of those which are rich in lines; it is very prominent in the Sun and in some stars of Class II*a*, and appears in the spectrum of *α Orionis* (Class III*a*) as one of the strongest lines. In the laboratory this line also shows an opposite behavior to that noted for 448.2^{mm}. It is hardly or not at all visible in the spark spectrum, but very strong and broad in the electric arc spectrum. LIVEING and DEWAR had already noticed the peculiarity of this line.

The favorable circumstance that two lines belonging to the same substance show opposite behavior, is a proof that the phenomena which these lines present on the stars can only be a function of temperature and not of pressure. Increased pressure broadens all lines of a gas and makes them more prominent. It cannot happen, according to KIRCHHOFF'S law, that a line becomes smaller with increased pressure. On the contrary, it is a well known fact that single lines may become weaker and smaller at higher temperature, while, generally speaking, the lines become stronger and broader under such conditions. Hence, I feel justified in announcing the following:

The temperature of the so-called absorbing strata—the upper strata of the photosphere—on the stars, Class III*a*, is approximately equal to that of the electric arc (about 3000° to 4000° C.); it is higher on the Sun and the stars of Class II*a*, but does not reach the intensity of the spark of a Leyden jar; on the stars of Class I*a* it approximates the temperature of this spark (upper limit about 15,000° C.).

This result furnishes at the same time the first direct proof for the correctness of the physical meaning of VOGEL'S spectral classification, according to which Class II has been developed by cooling of Class I, and Class III by still further cooling of Class II.

LETTER FROM DR. VEEDER REGARDING THE AURORA OF FEBRUARY 22, 1894.

"PROFESSOR E. S. HOLDEN, LICK Observatory, Mount Hamilton, Cal.

"*Dear Sir:* You will perhaps be interested to learn that the aurora of February 22 last, which was seen at LICK Observatory and elsewhere in Southern California, New Mexico, Arizona, etc., was not generally seen eastward in the United States until the